AI In Medicine: Considerations for Building Trust

Transparency, Reproducibility, Performance, Clinical Impact

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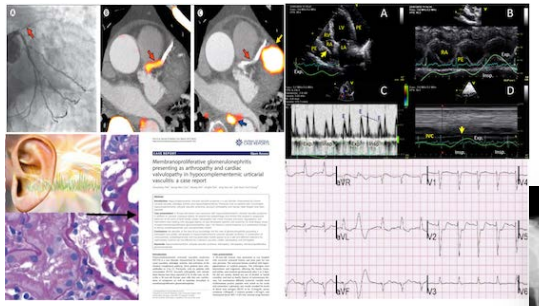
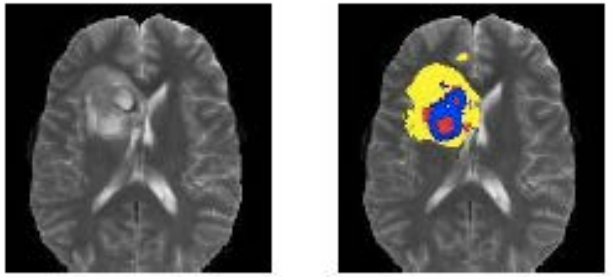
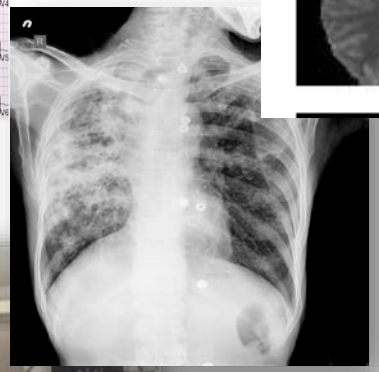
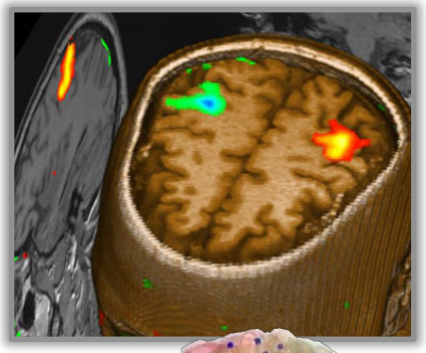
BIOMEDICAL IMAGING ML/AI PROJECTS

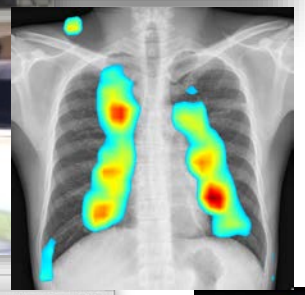
CADx, INFORMATICS, GLOBAL HEALTH, IMAGE DATABASES, QUESTION ANSWERING,

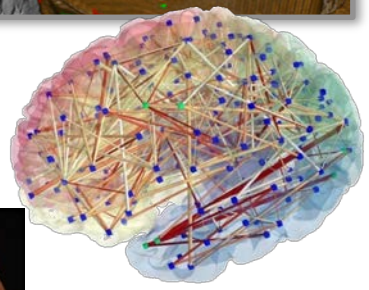


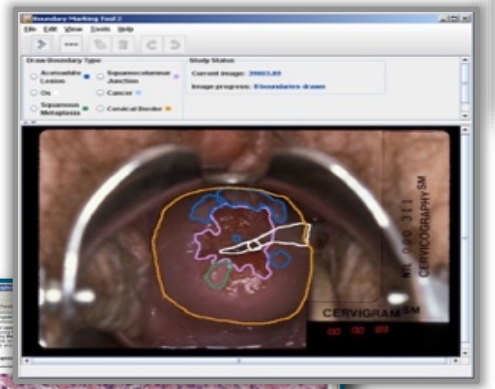


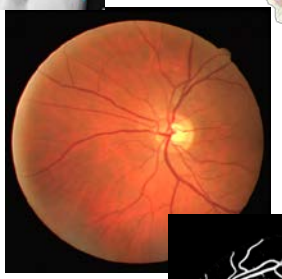


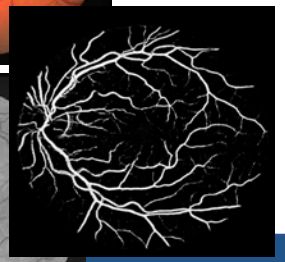


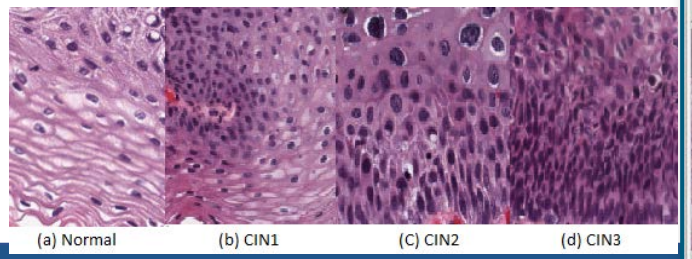












What do we want AI to be?

- Awesome!
- Transparent
  - As a user: be invisible
  - As a regulator (critic / cynic): not opaque about underlying technology
- Reproducible
- Explainable
- Improve existing processes

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Considerations:

- **Data**
  - Acquisition QA
  - Acquisition sensor sensitivity
  - Variety (Prevalence, coinfections)
  - Set Size, image (or datum) resolution
  - Sparsity
  - Relevance – How it answer the question? General AI or Narrow AI?
  - Modality (Data types, temporality)
  - Representing reality? (a perfect, curated and clean data set vs. dirty, real, missing)

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Considerations:

- **Algorithm Design**
  - AI Goals (Detection, Staging/Prognosis, Alerting)
  - Clinical purpose (clinician's aid, human-expert replacement, non-expert guidance)

- **Evaluation & Validation**
  - Evaluation measures – accuracy, recall, precision vs. sensitivity, specificity, and area under the operating curve
  - Role of statistics (sampling vs. exhaustive testing)
  - Training and test data partitioning, and collusion
  - Visualizing learning (internal layers vs. classification stage(s))
  - As the AI systems become more complex, how easily can these be teased out (particularly if the AI is building on prior work.)?

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Considerations:

- **Reproducibility**
  - How much non-private data is necessary to reflect AI performance?
  - Transparency in model design, data used, and training and test parameters

- **Development and Performance Consistency**
  - Dependency on GPU hardware,
  - Development platform,
  - Software version (libraries),
  - Data augmentation techniques

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Considerations:

- **Impact on Clinical Workflow**
  - Process change necessary?
  - Communicating with other (non-AI / AI) systems; standards
- **End-User Training**
  - User Complacency: “I took the action because the AI said so …”
  - Value of visualizations
- Continuous learning in AI (feedback), controls

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Questions? Thoughts? Comments?

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